Ray Thelwell 5 Jan 60

1. Problem of Torpedoes.

5/2 Find probability of hitting a ship when 4 torpedoes are fired if each torpedo has probability of 1/4 of hitting (ans. 68)

$$p(H) = 1/4$$

$$p(\text{Miss}) = 1 - 1/4 = 3/4$$

$$p(\text{exactly 1 hit in 4}) = p\begin{Bmatrix} H\ M\ M\ M \\ M\ H\ M\ M \\ M\ M\ H\ M \\ M\ M\ M\ H \end{Bmatrix} = \begin{Bmatrix} (1/4)(3/4)(3/4)(3/4) \\ (3/4)(1/4)(3/4)(3/4) \\ \text{"} \quad \text{"} \quad \text{"} \quad \text{"} \\ \text{"} \quad \text{"} \quad \text{"} \quad \text{"} \end{Bmatrix}$$

4 × combinations

$$= 4(1/4)(3/4)^3$$

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2. "Effective Management thru Probability Control"

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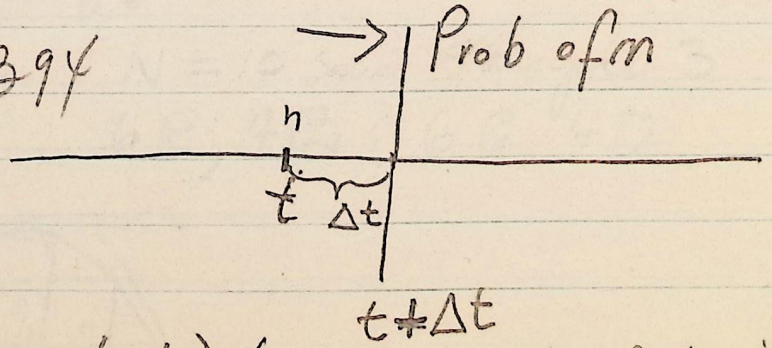
3. Page 394

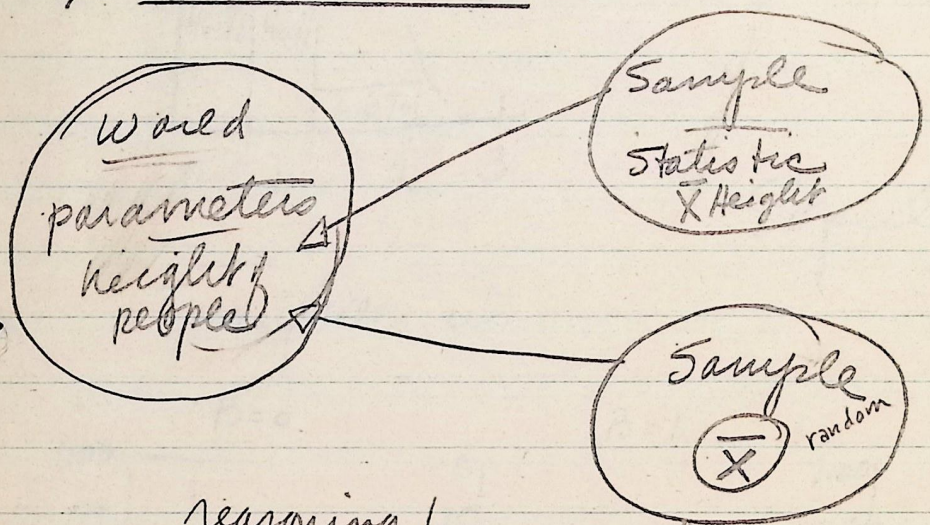


P(n items at t)(1 − P of arrival during Δt)
(1 − Prob of service during Δt)

$P(n \neq 1 \text{ at } t)(1 - P \text{ of arrival during } \Delta t)(\text{Prob of Servicing one during } \Delta t)$

$P(n \text{ at } t)(\text{Prob of arrival during } \Delta t)(\text{Prob of Seeing } \Delta t)$

4. Statistics.

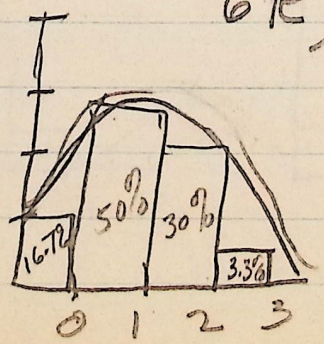


∴ reasoning from sample back to source; statistical inference

Help make decisions
Analyze

Example. $N = 10$ source Sample 3 $n = 3$

6R, 4B } 6G, 4D.

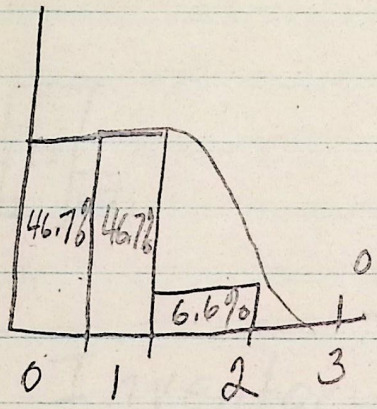


# of B in Sample of 3

4 cont

5 Jan 60

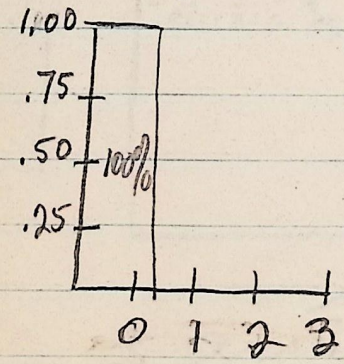
2 B



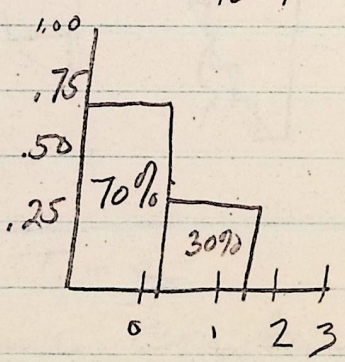
Population steel 10

Theory tells us:

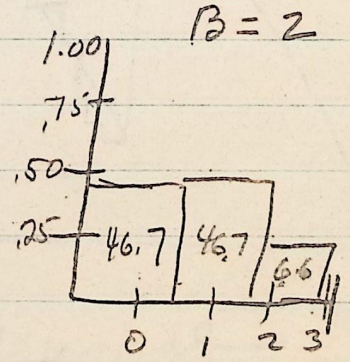
B = 0



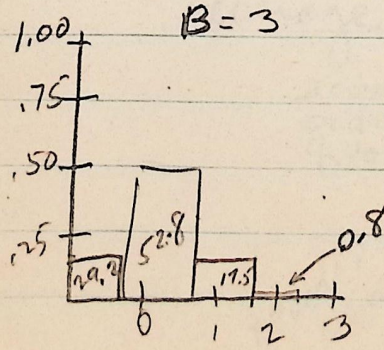
B = 1



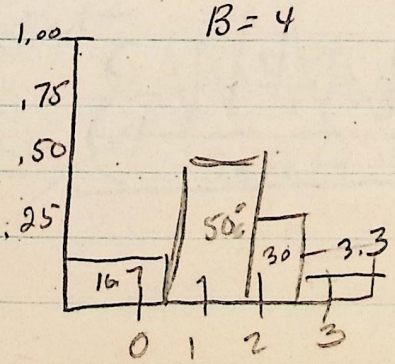
B = 2



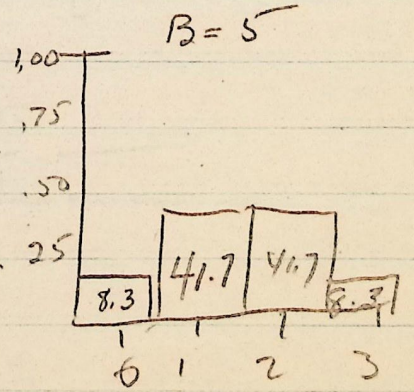
B = 3



B = 4



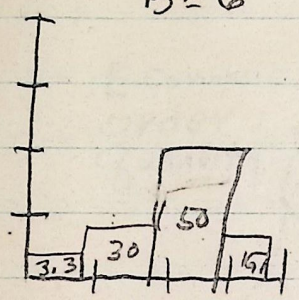
B = 5



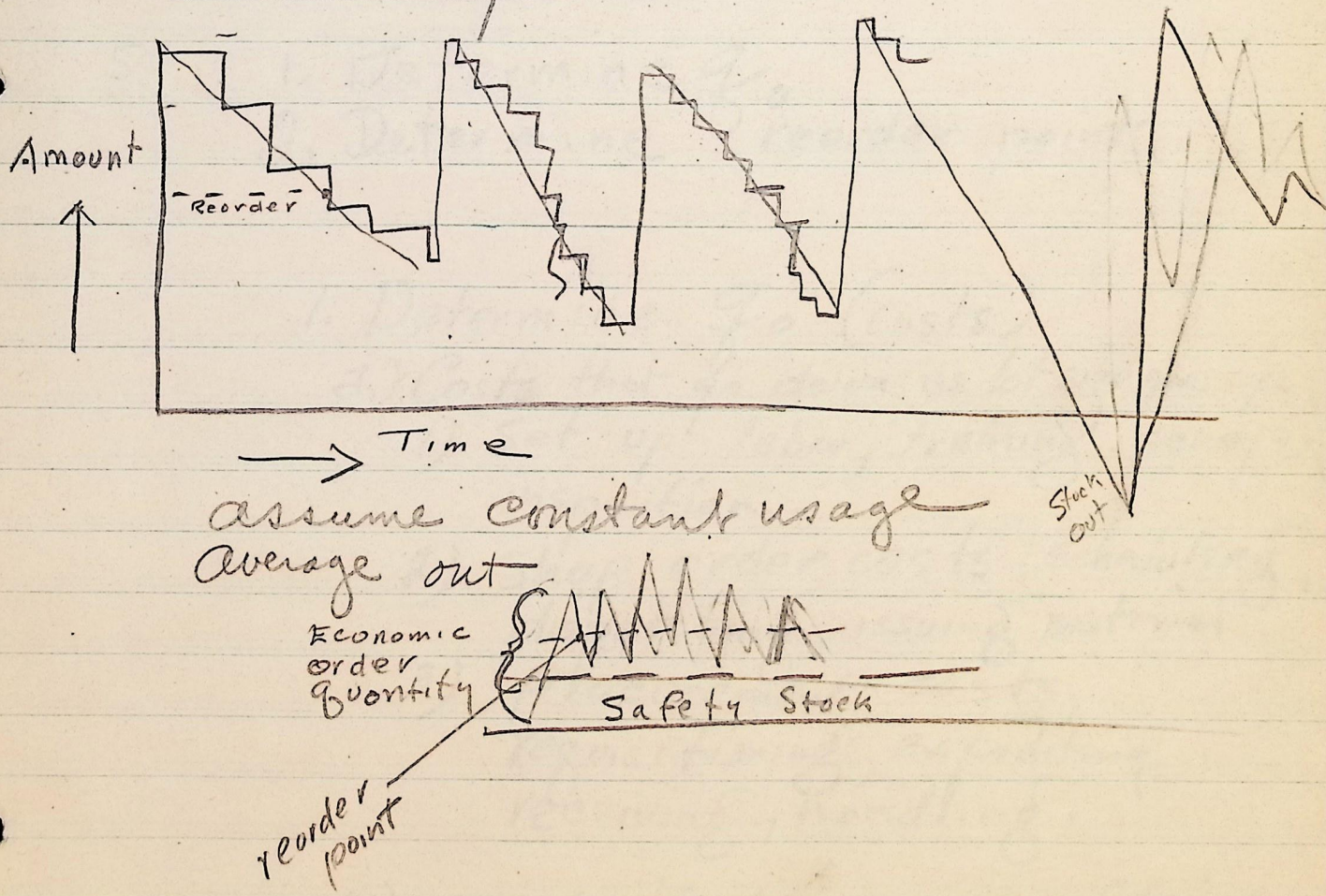
4 cont

5 Jan 60

B=6 B= 7 B= 8 B= 9 B=10

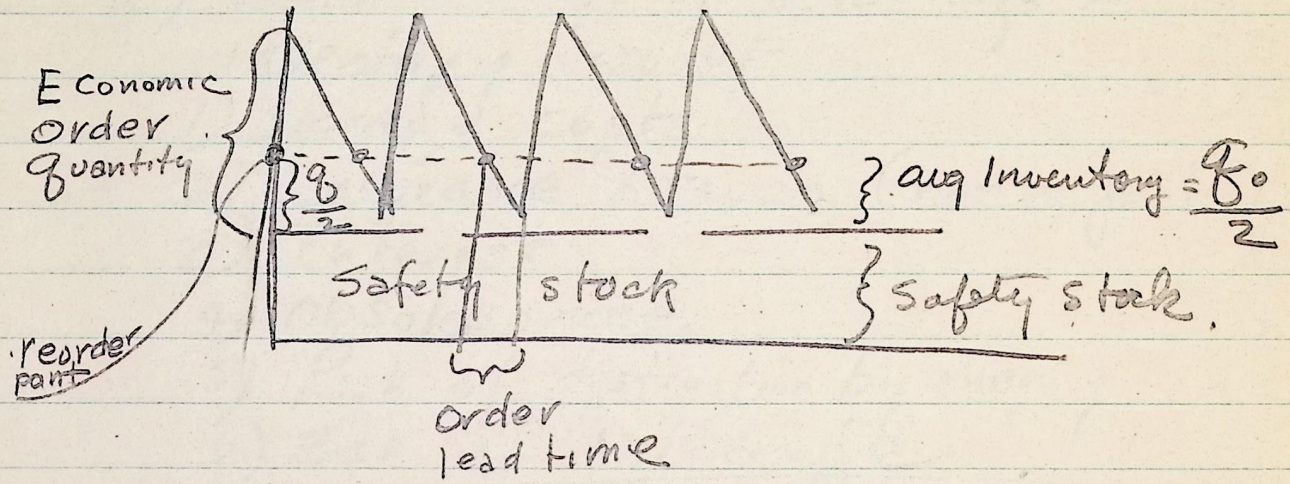


5. Inventory Models.



4 cont

5 Jan 60



5. 1. Determine q_o
2. Determine reorder point

1. Determine q_o (costs)
   a.) Costs that go down as lot size goes up.
      1) Set up, labor, training, scrap, inspection.
      2) Shop order costs - scheduling, dispatching, issuing material
      3) procurement costs, requisitioning, expediting, receiving, handling.
   b) Costs that go up as lot size & inventory go up.

5. cont

5 Jan 60

b.) Costs that go up as lot size & inventory go up.

1) Storage costs
2) Insurance & taxes (not in govt.)
3) Interest.
4) Obsolescence.
5) Risk of destruction by enemy
6) Risk of pilferage

AMA found 256 factors on both sides of ledger.

5 Jan 60

6. Problem

C_1 = Cost of holding one unit of goods for a specified period of time = $\frac{1}{12}$ of \$1 per month, ⇒ = C_1

C_s = Set up and procurement costs per order = \$100 per order.

$\left(\frac{R}{T}\right) \equiv M$ = Average rate of usage = 500 units per month. Determine order quantity & time between orders for least total cost for 1 year.

\$$\frac{1}{12}$ per month $\quad \frac{1}{2} q_o$

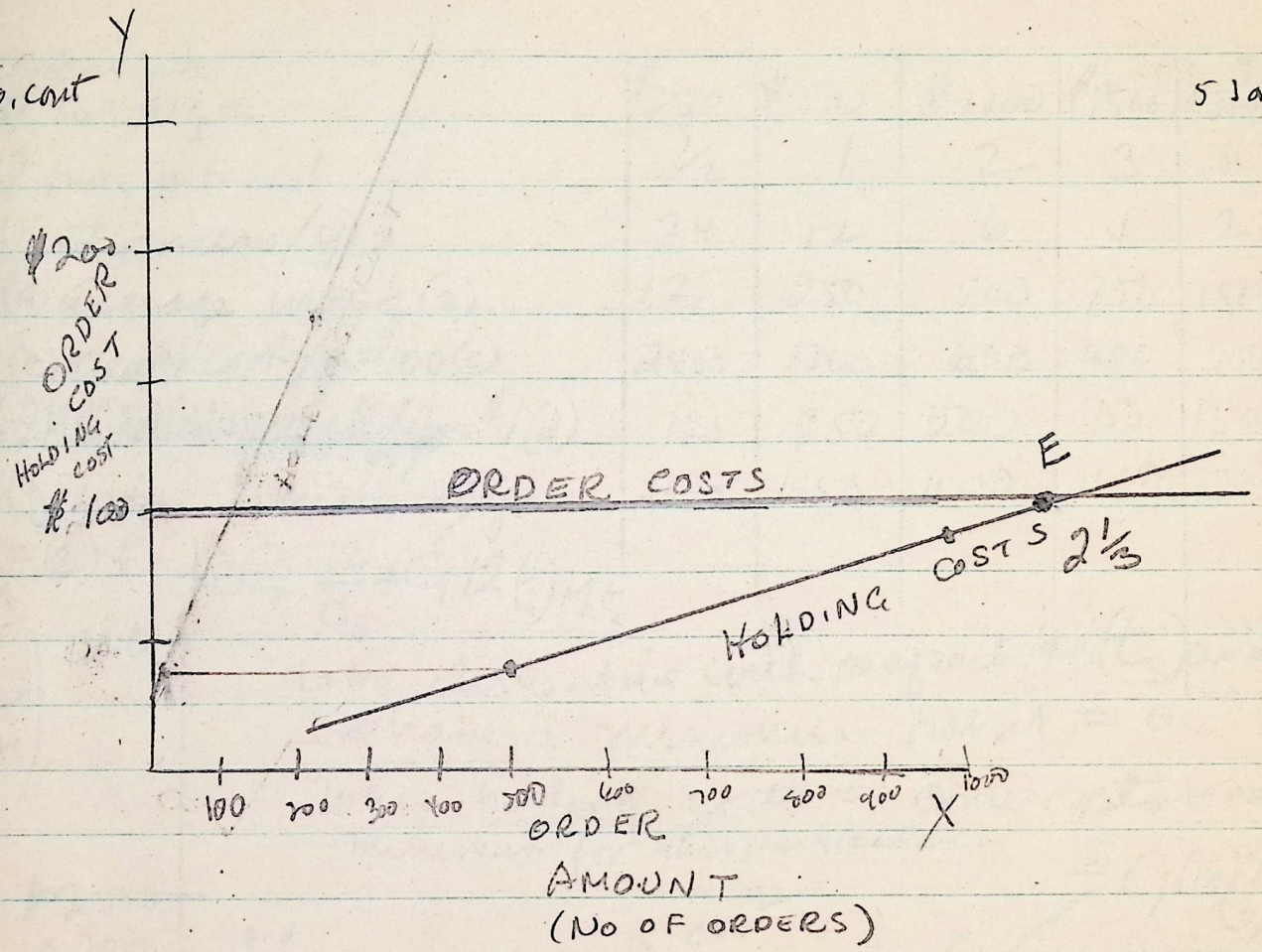
500 units per month. \$100 per month

cost of holding $\frac{1}{2} \frac{500}{\frac{1}{12}}$ = \$$\frac{125}{6}$ = \$20$\frac{5}{6}$

half month

month \$41 $\frac{2}{3}$

5 Jan 60



$100 per order

Cost per 500 = $41.67

2 months $83.34

100.00
83.34
16.66

6 continued

Mt_s (a) lot size	$250	$500	$1000	$1500	$3000	6000
t_s (b) time interval	1/2	1	2	3	6	12
$\frac{12}{t_s}$ (c) # orders/yr.	24	12	6	4	2	1
$\frac{1}{2}Mt_s$ (d) Average inv = $\frac{1}{2}$(a)	125	250	500	750	1500	3000
$C_s\frac{12}{t_s}$ (e) Order costs/yr = $100(c)	2400	1200	600	400	200	100
$C_1(12)(\frac{1}{2})Mt_s$ (f) Holding costs/yr = $1(d)	125	250	500	750	1500	3000
TEC (g) Total variable cost/yr	2525	1450	1100	1150	1700	3100

$TEC = (e) + (f) = C_s\frac{12}{t_s} + C_1 12(\frac{1}{2})Mt_s$

(total variable costs)

take derivative with respect to $d(t_s)$ and to have a minimum set it = 0.

When holding costs = order costs we have a minimum for that particular --

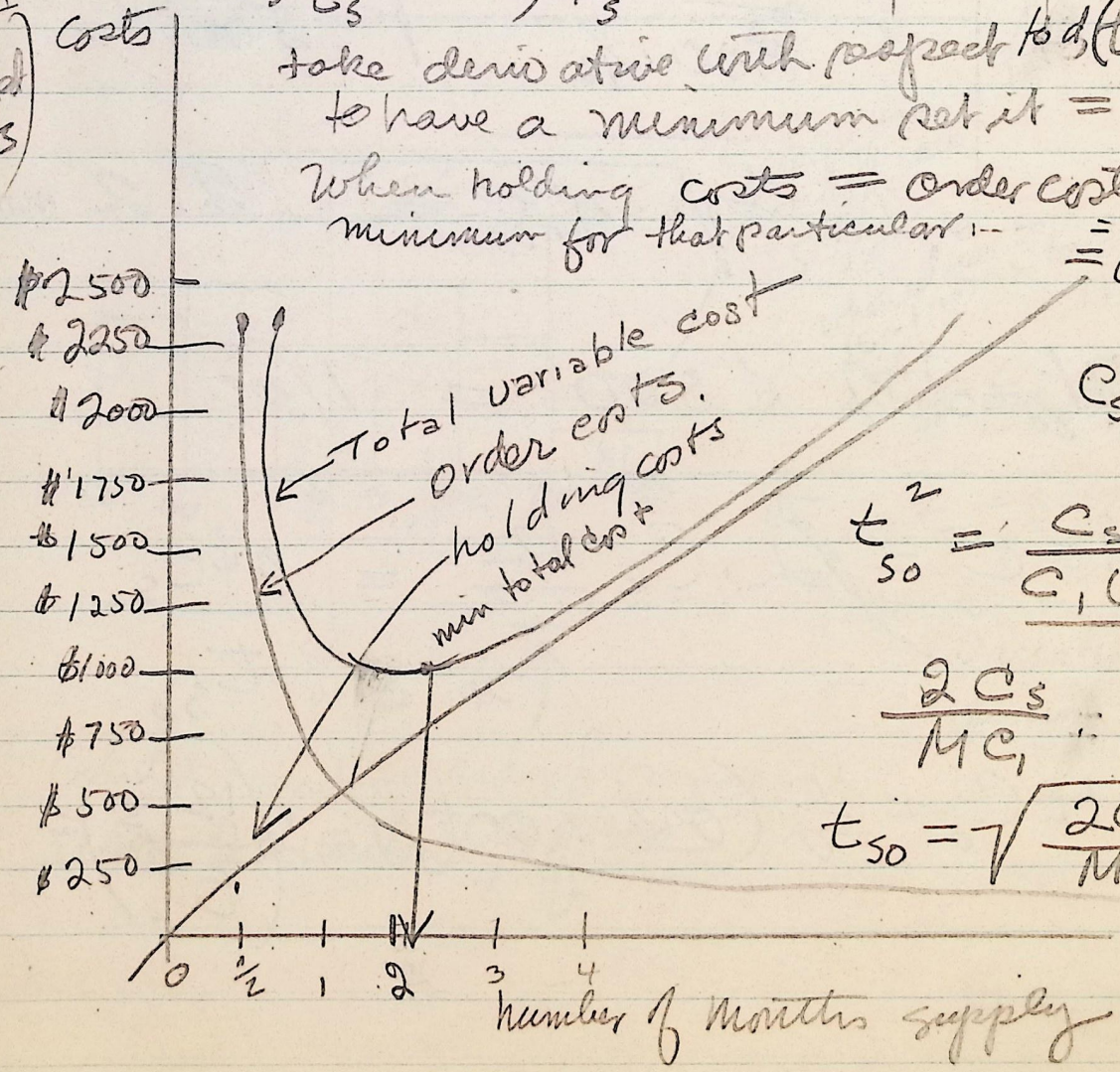
$= C_1(12)(\frac{1}{2})Mt_{so} =$

$C_s\frac{12}{t_{so}} =$

$t_{so}^2 = \frac{C_s(12)}{\frac{C_1(12)M}{2}} =$

$\frac{2C_s}{MC_1}$ ∴

$t_{so} = \sqrt{\frac{2C_s}{MC_1}}$



$$t_{so} = \sqrt{\frac{2C_s}{MC_1}}$$

$$t_{so} = \sqrt{\frac{2.100}{500 \cdot 1/12}} = \sqrt{\frac{2400}{500}} =$$

$$\sqrt{\sqrt{4.8}} = 2.2 \text{ months}$$

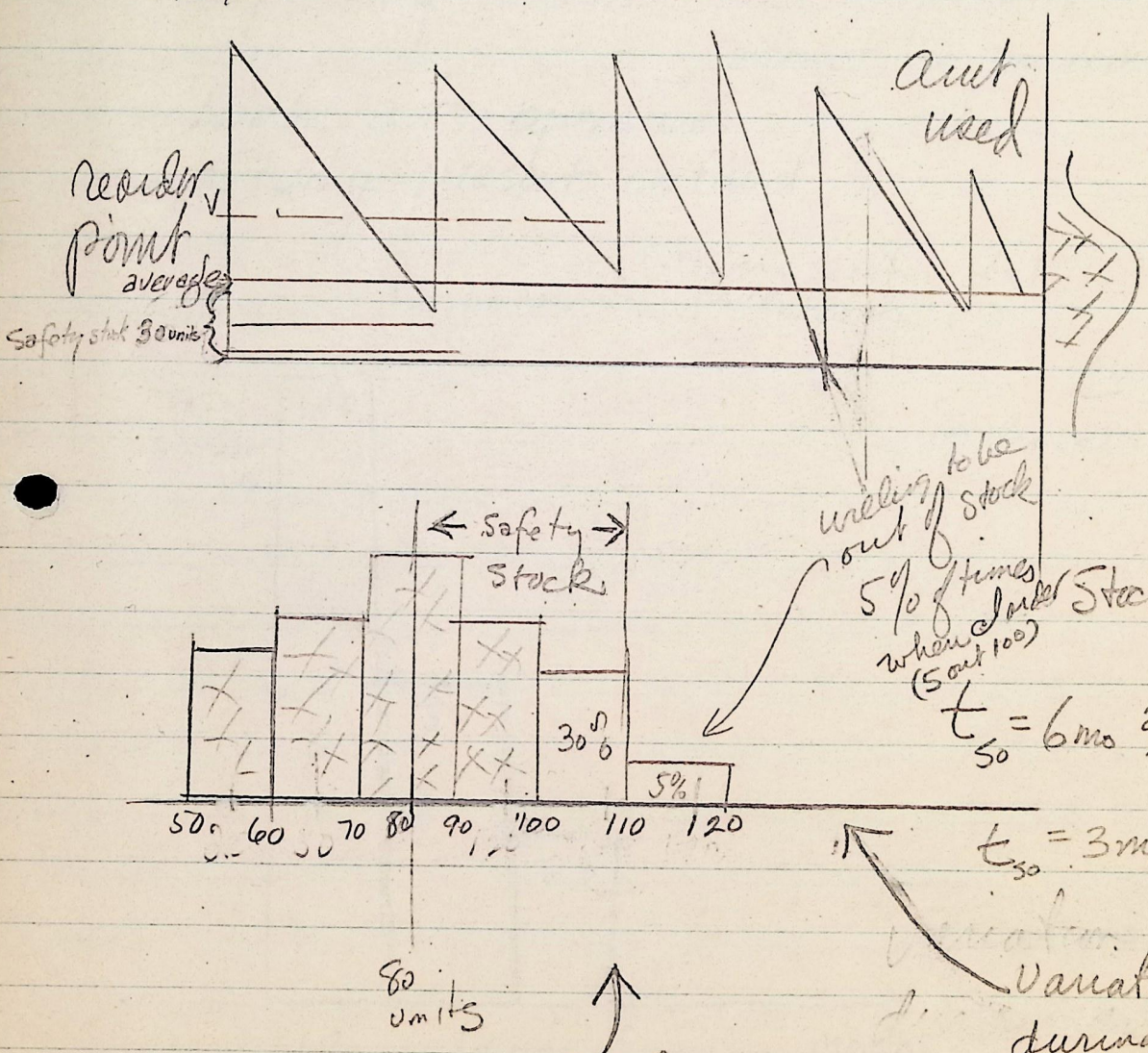
$$Q_o = Mt_{so} = 2.2 \times 500 = 1100$$

$$TEC_o = 2 \cdot C_s \frac{12}{t_{so}} = \frac{24C_s}{t_{so}}$$

$$TEC_o = 2(\text{order cost}_o) = 2\left(\frac{12C_s}{t_{so}}\right) =$$

7. 5 Jan 60 p.

Determination of Reorder point not in text


reorder point
average
Safety stock 30 units
amt used
Safety stock
30%
5%
50 60 70 80 90 100 110 120
waiting to be out of stock
5% of times when under (50 out 100)
Stockout once in 10 years
t_{50} = 6 mo 2/yr 1/20 = 5%
t_{30} = 3 mo 4/yr 1/40 = 2.5%
80 units
Variation in demand during order lead time
Counted each time ordered (requiring count)
used 20 units X % of time

8. Study of Inventory Model

5 Jan 60 p

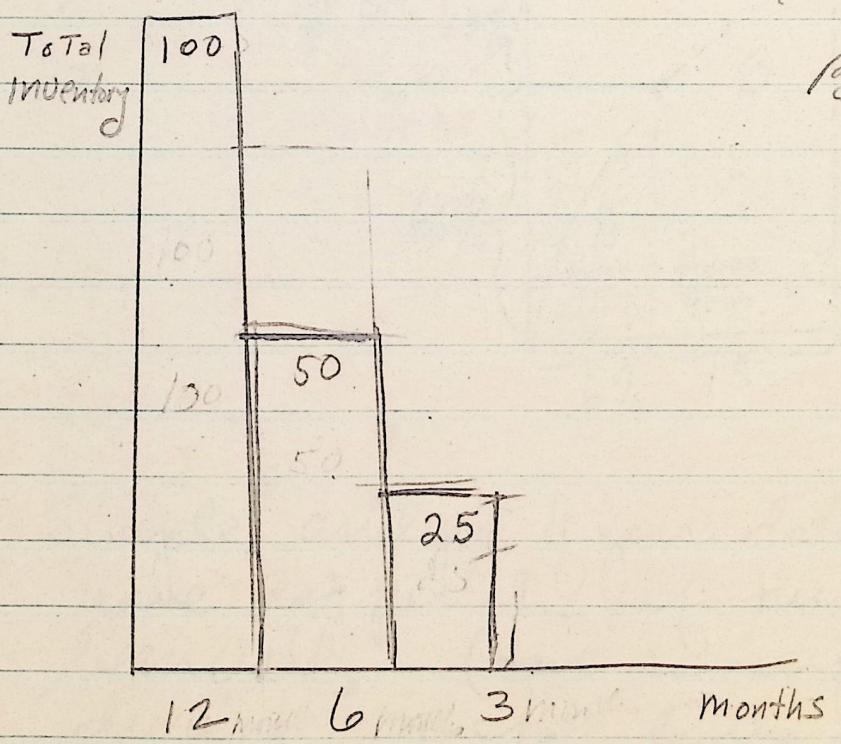
Conflicting interests such as procurement personnel interest in procurement costs

Look at operations
Study present method.

Turnover

Some interested in turnover of inventory

Poor Systems to Have
Blanket Rule 3 months
2 Months



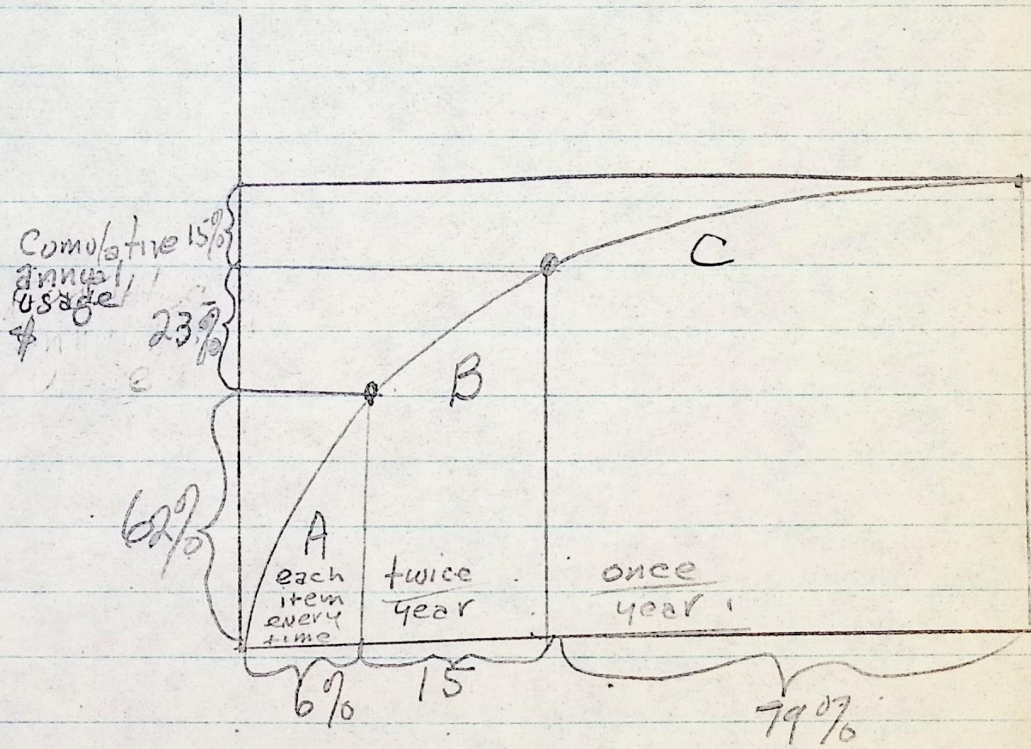
Look at usage. Look at random sample, maximum of 200 random items.

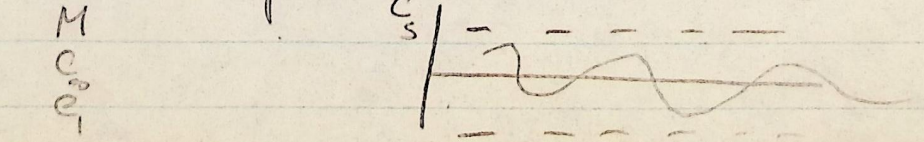
8 cont

5 Jan 60

Check

Items	Annual usage	orders Year	Average order
1			
2			
3			
4			
.			
.			
200			



Simple analysis of your data: What would have happened if this method had been used. (Have same forces been in effect during past. Only in controlled situation can we predict.)

Make up control chart (like quality control)